INTEGRATING GREEN SKILLS INTO TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING CURRICULUM FOR SUSTAINABLE WORKFORCE DEVELOPMENT AMONG YOUTHS IN NSUKKA LOCAL GOVERNMENT OF ENUGU STATE, NIGERIA

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Abstract

This study examined the integration of green skills into Technical and Vocational Education and Training (TVET) curricula for sustainable workforce development among youths in Enugu State, Nigeria. A descriptive survey design was adopted for the study. The population for the study was 200 persons, which consists of instructors, administrators, and students, with a sample of 100 respondents drawn from the population which consists of instructors, administrators, and students. The study was guided by five specific purposes and five research questions. Data were collected using a structured questionnaire on a four-point scale and analyzed using mean and standard deviation with a cut-off point of 2.50. The findings revealed that essential green skills include waste management, renewable energy, sustainable agriculture, and environmental management skills. However, the current TVET curriculum remains largely traditional, with low integration of green skills in teaching, learning materials, and industry collaboration. Major challenges identified include inadequate funding, weak policies, lack of trained instructors, and limited access to modern technologies. The study concluded that TVET programmes are not yet adequately aligned with the demands of a green economy. It recommended curriculum reform, improved teacher training, stronger policy support, and increased collaboration with industry to enhance the integration of green skills.

Keywords: Green Skills, Technical and Vocational Education and Training, Sustainable

Introduction

Green skills are referred to any skill, whether technical or transversal, that directly or indirectly supports various dimensions of the green transition. Green technical skills leverage scientific knowledge and abilities to facilitate the green transition, while green transversal skills include competencies, knowledge and skills that shape mindsets and attitudes toward this transition (European Commission,2022a) and (Exchange Trade Fund, 2021). The European Commission (EC,2022b) developed the ‘ESCO taxonomy of green skills', distinguishing between green skills, white skills and brown skills, which include 381 skills, 185 knowledge concepts and five transversal skills being relevant to a greener labour market. The transversal skills are often referred to as sustainability competencies, life skills or core skills. Sometimes it is used to refer to core skills such as environmental awareness, sometimes to technical skills relating directly to the environment, sometimes to skills in green technologies, sometimes to

skills for green sectors or green processes' (ILO 2015). According to the authors green skills are knowledge, principles, skills and perspective and mindset that are needed to protect the environment from pollution.

Technical and vocational education and training (TVET) is defined as "initial and continuing education and training provided by schools, training providers or enterprises that imparts the skills, knowledge and attitudes required for employment in a particular occupation, or group of related occupations, in any field of economic activity." (International Labour Organization ,2022). According to the authors Technical and vocational education and training (TVET) is a study and training that prepares the youth for particular trades in order to be self-reliance. Technical and Vocational Education and Training (TVET) play a crucial role in the green economy by equipping individuals with skills for sustainable practices. As industries shift towards eco-friendly operations, TVET adapts its curriculum to focus on eco-friendly technologies and sustainable development (UNESCO, 2024). This prepares students for green careers and fosters a deeper understanding of sustainability, promoting environmentally conscious behaviours. By connecting education to the labour market, TVET shapes a capable workforce committed to supporting the green transition. (UNESCO, 2024). The integration of green skills into the TVET curriculum ensures that youth are not only employable but also capable of contributing to sustainable practices in industries, agriculture, and services (ILO, 2020). In Nsukka Local Government Area of Enugu State, there is growing awareness of the need for sustainable workforce development. However, the extent to which TVET programs equip youth with green competencies remains largely unexplored. Globally, successful integration of green skills into TVET involves curriculum redesign, teacher training, public-private partnerships, and policy support (UNESCO, 2023). In the Nigerian context, there is a growing recognition of the need for such integration, but challenges such as inadequate funding, lack of trained personnel, and outdated curriculum frameworks limit progress (Adewumi, 2020).

Despite the global emphasis on sustainability, TVET programs in Nigeria have traditionally focused on conventional technical skills, often neglecting environmental consciousness and sustainability practices (Okoro, 2021). As industries increasingly demand workers who can operate in eco-friendly and sustainable environments, the lack of green skills among graduates poses a significant challenge to workforce development. Youth in Nsukka, in particular, face the dual burden of unemployment and limited exposure to green competencies. This gap necessitates an empirical investigation into the integration of green skills into TVET

curricula and the strategies that can be employed to enhance sustainable workforce development.

Purpose of the Study

The general of this study is **i**ntegrating Green Skills into Technical and Vocational Education and Training Curriculum for Sustainable Workforce Development among Youths in Nsukka Local Government of Enugu State, Nigeria**.** Specifically, the study sought to:

i. Identify the green skills required for sustainable workforce development among youths.
ii. Examine the current state of TVET curriculum in Enugu State.
iii. Determine the extent to which green skills are currently integrated into TVET programmes.
iv. Identify strategies for integrating green skills into TVET curriculum.
v. Examine the challenges affecting the integration of green skills into TVET curriculum

Research Questions

The study will be guided by the following research questions:

i. What are the green skills required for sustainable workforce development among youth?
ii. What is the current state of TVET curriculum in Enugu State?
iii. To what extent are green skills integrated into TVET programmes?
iv. What are the strategies for integrating green skills into TVET curriculum?
v. What are the challenges affecting the integration of green skills into TVET curriculum in Enugu State?

Methodology

The study adopted a descriptive survey research design. According to John (2023), descriptive survey research design is a research method used to describe the characteristics, opinions, behaviours, or conditions of a population by collecting data from a sample through questionnaires, interview, or observation. The design was considered appropriate because it enables the researcher to elicit information from respondents and describe their opinion. Enugu State was selected because it possesses the characteristics relevant to the study. The population of the study comprises 200 participants. consisting of 60 instructors, 4 TVET administrators and 136 students in selected TVET institutions in Enugu State. A sample of 100 participants was selected using a simple random sampling technique. The sample consisted of 16 instructors, 4 TVET administrators, and 80 students. The study mixed students, teacher, and

instructors because each group play different roles in the educational process. The instrument for data collection was structured questionnaires designed by the researcher. The questionnaires contained sections A to E, what are the green skills required for sustainable workforce development among youth? what is the current state of TVET curriculum in Enugu State? To what extent are green skills integrated into TVET programmes? what are the strategies for integrating green skills into TVET curriculum? and what are the challenges affecting the integration of green skills into TVET curriculum in Enugu State? Each of the section contained 7 items. The items are rated on a four-point scale ranging from "Strongly Disagree (1) to "Strongly Agree" (4). A cut-off mean of 2.50 was used for decision -making, where a mean score of 2.50 and above indicated agreement, while a mean score below 2.50 indicated disagreement. The instruments were face validated by three experts from the department of Agricultural Education, University of Nigeria Nsukka. Cronbach Alpha reliability method was used to determine the consistency of the instrument. The data collected were analyzed using the Statistical Package for Social Science (SPSS). The statistical tool used was mean and standard deviation.

Results

Research Question 1: What green skills are required for sustainable workforce development among youth?

Table 1: Mean ($\bar{x}$) responses of the respondents on green skills required for sustainable workforce development among youth

S/N	Items	M	SD	Decision
1	Waste management skills	3.38	0.80	Agree
2	Renewable energy knowledge	3.45	0.72	Agree
3	Energy-efficient practices	3.41	0.75	Agree
4	Sustainable agriculture	3.50	0.68	Agree
5	Eco-friendly production techniques	3.29	0.82	Agree
6	Environmental monitoring skills	3.36	0.77	Agree
7	Environmental policies knowledge	3.44	0.70	Agree

Table 1 shows the mean opinion of green skills required for sustainable workforce development among youth. Seven items had mean value of 3.29 to 3.50 and the standard deviation (SD) ranged from 0.72 to 0.82. This indicated that all the items agreed with the green skills required for sustainable workforce development among youth.

Research Question 2: What is the current structure of TVET curriculum in Enugu State?

Table 2: Mean ($\bar{x}$) responses of the respondents on the current structure of TVET curriculum in Enugu State

S/N	Statement	M	SD	Decision
1	Industry stakeholders are consulted	2.35	0.90	Disagree
2	Curriculum is regularly updated	2.40	0.88	Disagree
3	TVET focuses mainly on technical skills	2.52	0.75	Agree
4	Adequate exposure to green practices	2.20	0.93	Disagree
5	Sustainability topics are included	2.48	0.91	Disagree
6	Includes emerging technologies	2.38	0.95	Disagree
7	Practical training dominates	3.10	0.84	Agree

Table 2 above shows that two items on the current structure of TVET curriculum in Enugu State had their mean ranged from 3.10 to 3.30 which shows agreed, while the five items had their mean ranged from 2.10 to 2.38 which is below the cut-off point of 2.50. This indicated that the respondents disagree with the statement that Industry stakeholders are consulted in preparation of curriculum, curriculum is regularly updated among others.

Research Question 3: To what extent are green skills integrated into TVET programmes?

Table 3 shows the mean opinion of respondents on the extent to which green skills are integrated into TVET programmes. The mean values ranged from 2.28 to 2.61, while the standard deviation (SD) ranged from 0.80 to 0.96. This indicates that most of the items were disagreed with, except for a few that were agreed upon. Overall, this implies that green skills are not adequately integrated into TVET programmes.

Table 3: Mean ($\bar{x}$) responses of the respondents on the extent green skills are integrated into TVET programmes.

S/N	Statement	M	SD	Decision
1	Assessment evaluates green skills effectively	2.55	0.70	Agree
2	Green skills are included in course outlines	2.52	0.84	Agree
3	Learning materials include sustainability content	2.47	0.87	Disagree
4	Students participate in green skill activities	2.61	0.80	Agree
5	Instructors teach sustainability topics regularly	2.39	0.91	Disagree
6	Industry partnerships support green skills training	2.28	0.96	Disagree
7	Green skill integration is consistent across programs	2.44	0.89	Disagree

Research Question 4: What strategies can be used to integrate green skills into TVET curriculum?

Table 4: Mean ($\bar{x}$) responses of the respondents on the strategies that can be used to integrate green skills into TVET curriculum.

S/N	Statement	M	SD	Decision
1	Adequate resources are necessary for integration	3.62	0.59	Agree
2	Industry partnerships support green-focused courses	3.51	0.66	Agree
3	Policies/frameworks can guide integration of green skills	3.28	0.81	Agree
4	Project-based learning is effective for green skills	3.57	0.63	Agree
5	Curriculum developers can identify relevant green skills	3.36	0.77	Agree
6	Teacher training can incorporate green skills	3.44	0.72	Agree
7	Assessment systems can measure green skills	3.39	0.75	Agree

Table 4 revealed that all the seven items on the strategies that can be used to integrate green skills into TVET curriculum had their mean value ranging from 3.28 to 3.62. This shows that

the mean of each of the seven items was above the cut-off points of 2.50. Indicating that the respondents agreed that all the seven items are strategies that can be used to integrate green skills into TVET curriculum. The table further showed that the standard deviation (SD) of the items was within the range of 0.59 to 0.81 in seven items, indicating that the opinions of the respondents were not far from each other in their responses to the seven items.

Research Question 5: What challenges hindering the integration of green skills into TVET program in Enugu State?

Table 5: Mean ($\bar{x}$) responses of the respondents on the challenges hindering the integration of green skills into TVET program in Enugu State.

S/N	Statement	M	SD	Decision
1	Limited funding and resources	3.60	0.64	Agree
2	Lack of government policies/regulatory support	3.42	0.71	Agree
3	Limited access to modern technology and tools	3.47	0.73	Agree
4	Low student awareness/interest in green skills	3.18	0.86	Agree
5	Instructors lack adequate training in green skills	3.33	0.79	Agree
6	Curriculum does not prioritize sustainability	3.28	0.83	Agree
7	Weak or nonexistent industry partnerships	3.55	0.68	Agree

Table 5 revealed that all the seven items on the challenges hindering the integration of green skills into TVET program in Enugu State had their mean value ranges from 3.18 to 3.60. This shows that the mean of each of the seven items was above the cut-off points of 2.50. Indicating that the respondents agreed that all the seven items are the challenges hindering the integration of green skills into TVET program in Enugu State. The table further showed that the standard deviation (SD) of the items was within the range of 0.64 to 0.86 in seven items, indicating that the opinions of the respondents were not far from each other in their responses in seven items.

Discussion of Findings

The findings revealed that green skills required for sustainable workforce development among youth are Waste management skills, Renewable energy knowledge, Energy-efficient practices, Sustainable agriculture, Eco-friendly production techniques, Environmental

monitoring skills and Environmental policies knowledge. These findings are not in line with the findings of Sern, Zaime, and Foong, (2018) who of recent affirmed that both technical skills and generic skills are important for getting a job. However, this scenario has changed.

According to the findings on the current structure of TVET curriculum in Enugu State, it was revealed that Industry stakeholders are not consulted in structuring curriculum, Curriculum is not regularly updated, VET focuses mainly on technical skills only, no adequate exposure to green practices, there is no Sustainability topics included in the curriculum among others. This study is not in line with the study of Schwab (2019) who suggested that the revolution could lead to greater inequality, particularly in its potential to disrupt labour markets. The findings on the extent green skills are integrated into TVET programmes revealed that there is no assessment evaluation of green skills effectively, green skills are not included in course outlines, there is no Learning materials. including no sustainability content, Students participate in green skill activities, Instructors are not teaching sustainability topics regularly, Industry partnerships do not support green skills training and green skill's integration is not consistent across programs. The findings are not consistent with the study of Misra and Khurana, (2017) which said that technical skills are specialized work and basic academic skills, these skills are further classified as science.

The findings indicated a low level of integration of green skills into TVET programmes, particularly in teaching, assessment, and learning materials. This finding is consistent with Adjei et al. (2023), who reported that green skills are not yet fully integrated into TVET systems in developing countries. In the same vein, Abubakar et al. (2019) found gaps in the incorporation of sustainability concepts in technical programmes. However, David and Daniels (2024) noted that efforts are gradually being made to integrate green skills into TVET program through reforms, although progress remains slow.

The results revealed that the respondents agreed on several effective strategies for integrating green skills into TVET program, including policy frameworks, industry partnerships, teacher training and provision of resources. This result is consistent with the study of Madhukar (2023) on Innovative Approaches to Teaching and Learning. The results showed that the main challenges hindering the integration of green skills into TVET include lack of funding, weak policies, inadequate teachers training, poor industrial collaboration and limited access to technology. This finding is consistent with Nuffi (2025), who identified funding constraints, poor infrastructure and lack of institutional support as the main barriers to implementing green skills in TVET.

Conclusion

Integrating green skills into the TVET curriculum in Nsukka LGA of Enugu State is essential for sustainable workforce development. Equipping youth with green competencies not only enhances employability but also promotes environmental stewardship and economic growth. While challenges exist, strategic interventions, including curriculum reforms, teacher capacity building, and industry collaboration, can significantly improve the effectiveness of TVET programs.

Recommendations

Based on the findings, the following recommendations are made:

1. Curriculum Reform: TVET institutions should incorporate modules on renewable energy, sustainable agriculture, and environmental management into existing programs.
2. Instructor Training: Continuous professional development programs should be organized to train educators on green skills and teaching methodologies.
3. Public-Private Partnerships: Collaboration with industries practicing sustainable methods can provide practical experience for students.
4. Awareness and Advocacy: Sensitization campaigns for stakeholders on the importance of green skills can drive policy support and funding.
5. Research and Monitoring: Continuous assessment of curriculum effectiveness in promoting green skills is necessary to ensure relevance and impact.

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